

Retrospective Vaccination Coverage Survey

2013-2014 Results (School Year 2017-2018)



Kelly Gillespie, MPH
Bureau of Epidemiology and Public Health Informatics
Division of Health
Kansas Department of Health and Environment
1000 SW Jackson, Suite 075
Topeka, Kansas 66612-1290
Telephone (877) 427-7317
Fax (877) 427-7318

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Background

The Kansas Kindergarten Immunization Coverage Assessment is an annual study conducted by the Kansas Department of Health and Environment (KDHE) to assess vaccination coverage among kindergarten students. The population for this study includes kindergarten students between the ages of five and seven years on the first day of the academic year and enrolled in either a public or private school in Kansas. This retrospective study utilized data from the 2017-2018 Kindergarten Immunization Coverage Assessment to calculate vaccination coverage levels among those children when they were 24 and 35 months of age. Children who attend state licensed child care facilities are required to be age appropriately vaccinated for DTaP (diphtheria, tetanus, pertussis), Hib (*Haemophilus influenzae* type b), hepatitis A, hepatitis B, MMR (measles, mumps, rubella), PCV (pneumococcal disease), polio, and varicella.

The Advisory Committee for Immunization Practices (ACIP) recommends children by 24 months of age receive the following immunizations in Table 1.¹

Table 1: ACIP Immunization Recommendations by 24 Months of Age

	Vaccine For	Number of Doses	Healthy People 2020 Coverage Goals
DTaP4	Diphtheria, Tetanus, Pertussis	4	90%
HepB3	Hepatitis B	3	
Hib3	<i>Haemophilus influenzae</i> type b	3	
MMR1	Measles, Mumps, Rubella	1	
PCV4	<i>Streptococcus pneumoniae</i>	4	
Polio3	Polio	3	
Var1	Varicella	1	
HepA2	Hepatitis A	2	85%
4-3-1-3-3-1-4	DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4	N/A	80%

Methods

Sampling and Data Collection

Each public and private school in Kansas with a kindergarten class received a letter requesting participation in this study.

Schools were assigned to one of three groups:

1. Send in 30 vaccination records selected at random
2. Send in all vaccination records (for schools with less than 30 kindergarten students)

¹ Child and Adolescent Immunization Schedule from Centers for Disease Control and Prevention

3. Send in no vaccination records

Paper vaccination records were sent to KDHE with all personal information removed from each record, except date of birth. Records were excluded if date of birth was missing or illegible, child was <5 years or >7 years of age.

Data Analysis

Sample population for vaccination coverage analysis included children with date of birth on vaccination record that met age requirements for inclusion. Data was weighted based on county size and kindergarten school type (public or private) for:

- DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, PCV4, HepA2, and the 4-3-1-3-3-1-4 series
 - Coverage of these vaccines and series at 24 months of age
 - Coverage of these vaccines and series at 35 months of age

A child was considered up-to-date (UTD) for the 4-3-1-3-3-1-4 series if they had received DTaP4, Polio3, MMR1, Hib3, HepB3, Var1, and PCV4 vaccinations. Coverage results were compared to the National Immunization Survey (NIS); a population-based, random, telephone survey conducted by the Centers for Disease Control and Prevention (CDC) annually.

Analyses for vaccination coverage included:

- Statewide results - trended by year
- Comparison to national coverage (NIS-Child)
- By county level

Results & Implications

There were 347 schools that provided 7,929 records for this study (Table 2). Records from schools not included were either not selected to submit records, did not respond to the request for records, or did not respond in time. All 105 Kansas counties were represented in analysis.

Table 2: Study population by study year – Kansas

Study Year	School Year	Public Schools	Private Schools	# Records Submitted	Response Rate	Counties Represented (out of 105)
2010-2011	2014-2015	349	40	9,219	94%	102
2011-2012	2015-2016	302	54	8,304	94%	105
2012-2013	2016-2017	260	37	6,748	80%	105
2013-2014	2017-2018	298	49	7,929	93%	105

Statewide Vaccination Coverage

- At 24 months of age:
 - Healthy People 2020 (HP2020) metrics were met for Polio3, MMR1, and HepB3 (Figure 1).
 - HepB3 had the highest coverage at 92.9%.
- At 35 months of age:
 - HP2020 metrics were still not met for DTaP4, Hib3, PCV4, HepA2, or 4-3-1-3-3-1-4.
 - HepA2 coverage increased the most from 48.2% at 24 months of age to 74.2% at 35 months of age.
 - Coverage significantly increased in children from 24 to 35 months of age for DTaP4, MMR1, Var1, PCV4, HepA2, and the 4-3-1-3-3-1-4 series.

Implications:

- PCV4 coverage (77.6%) remains below the HP2020 goal of 90% for children 35 months of age.
 - Children under two years and in daycare are at an increased risk for disease.²
 - Severe illness can lead to disabilities such as deafness, brain damage, or loss of arms or legs. One in 15 children who contract pneumococcal meningitis dies³.
 - PCV4 is required for child care attendance, but not required for school entry at kindergarten and may be under reported on immunization records utilized for this study.
- DTaP4 was the only vaccine required for child care attendance that is below the 90% HP2020 goal for children at 35 months.
 - Pertussis can be very dangerous for babies and young children; it can even result in death. High vaccination coverage needs to be maintained to prevent the spread of pertussis⁴.
 - DTaP4 coverage increased to 97% by kindergarten⁵, indicating some children might not have attended child care; therefore compliance could not be enforced or some children might have been on an alternate vaccination schedule for DTaP4.

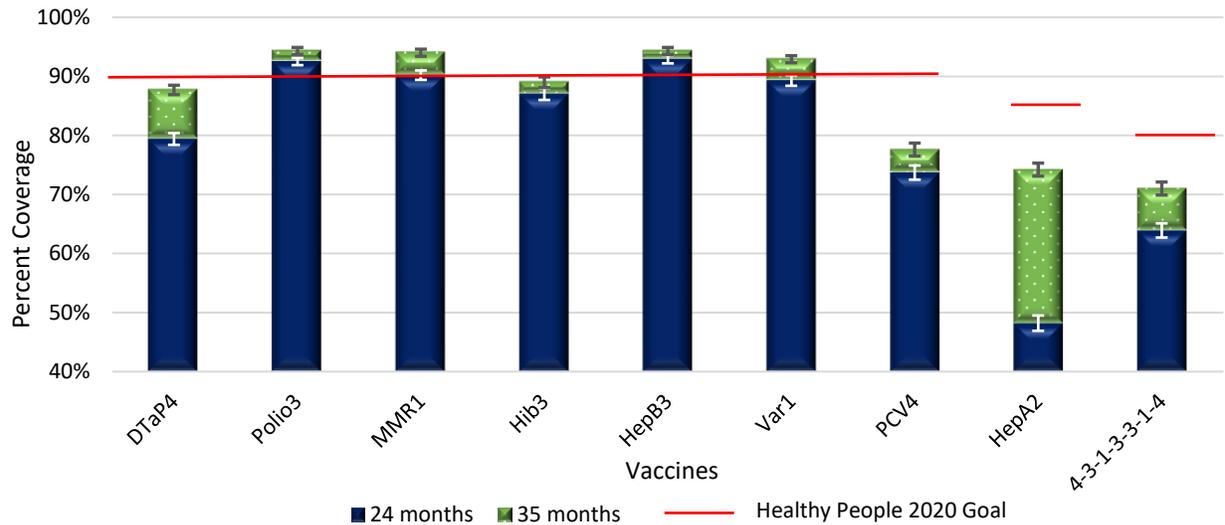
² Pneumococcal Disease and the Vaccine (Shot) to Prevent It - CDC

³ Hamborsky, J., Kroger, A., & Wolfe, C. (2015). Pneumococcal Disease. In *Epidemiology and prevention of vaccine-preventable diseases* (pp. 279-295). Atlanta, GA: Centers for Disease Control and Prevention.

⁴ Whooping Cough (Pertussis) Fact Sheet for Parents | CDC. (n.d.). Retrieved February 5, 2019, from <https://www.cdc.gov/vaccines/parents/diseases/child/pertussis.html>

⁵ Gillespie, K. (n.d.). *Kindergarten Vaccination Coverage Survey: School Year 2017-2018* (Tech.). doi:http://www.kdheks.gov/immunize/download/Kindergarten_2017-18.pdf

Figure 1: Statewide vaccination coverage at 24 and 35 months of age – Kansas, 2013-2014



Statewide Vaccination Coverage at 35 Months - Trended by Study Year

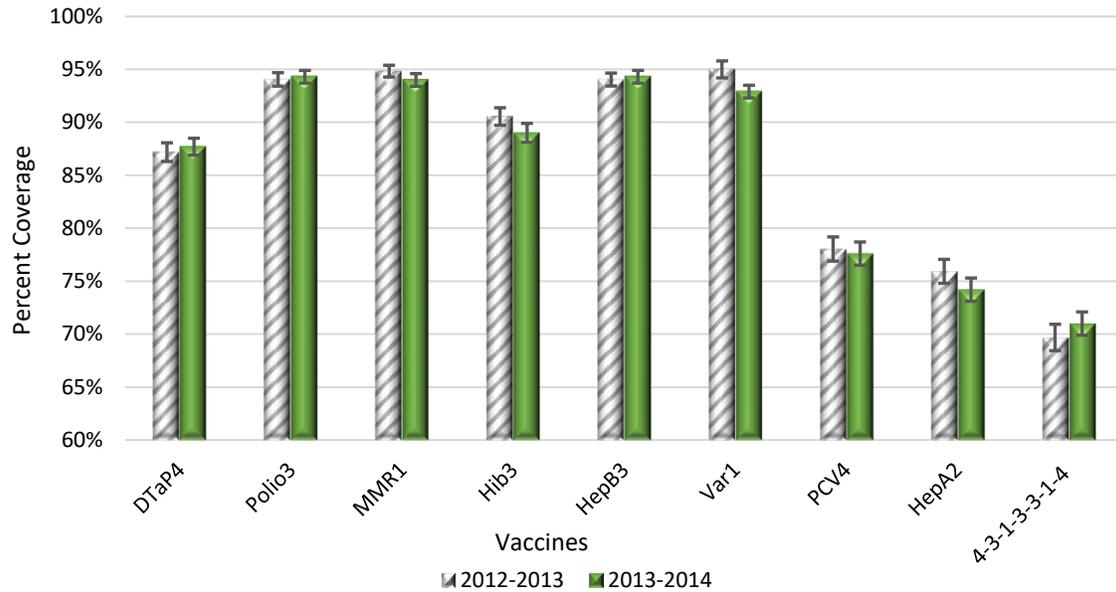
- Although still above the 90% HP2020 goal, there was a significant decrease in coverage for Var1 in 2013-2014 year compared to the previous year (-2.3%) (Figure 2).
- No other significant changes in coverage were observed for any other vaccines in 2013-2014 when compared to the previous year.

Implications:

- Varicella disease has a secondary attack rate of 61%-100% among susceptible household contacts⁶.
 - Decrease in vaccine coverage for varicella provides an opportunity for increased risk of varicella outbreaks in Kansas.

⁶ Hope-Simpson RE. Infectiousness of communicable diseases in the household (measles, chickenpox and mumps). *Lancet* 1952;260(67374):549-54. DOI: 10.1016/S0140-6736(52)91357-3

Figure 2: Vaccination coverage at 35 months of age by year – Kansas, 2012-2013 to 2013-2014



National Immunization Survey (NIS)-Child Coverage at 19-35 Months of Age

- Compared to NIS-Child national coverage levels, Kansas retrospective participants had:
 - Significantly less coverage for Hib3 and PCV4
 - Significantly higher coverage for DTaP4, MMR1, HepB3, Var1, and HepA2 (Table 3).

Table 3: Vaccination coverage level by study type

	Kansas Retrospective 35-month-olds	United States NIS-Child [§] 19-35-month-olds
DTaP4	87.7%*	84.2%
Polio3	94.3%	93.3%
MMR1	94.0%*	91.5%
Hib3	89.0%*	92.6%
HepB3	94.3%*	91.6%
Var1	92.9%*	91.0%
PCV4	77.6%*	82.9%
HepA2	74.2%*	57.5%
4-3-1-3-3-1-4 series	71.0%	71.6%

[§]Based on 2014 NIS-Child, children aged 19-35 months of age

*Significantly different from national NIS

Implications:

- Hib3 and PCV4 coverage are significantly lower among retrospective participants than NIS participants.

- While required for child care, Hib3 and PCV4 are not required for kindergarten school entry and may be under reported on the immunization records which served as the data source for the retrospective study.
- Many immunizations required for entry into Kansas daycares had significantly higher coverage among retrospective participants than national averages.
 - Vaccination requirements for other states might differ from Kansas in that they might be less strict in the specific vaccines or number of doses required to attend licensed child care facilities or Kansas might have less pockets of vaccine hesitant populations when compared to the rest of the U.S. This makes Kansas less vulnerable for vaccine-preventable disease outbreaks in settings with children when compared to the nation.

Vaccination Coverage by County

County-level vaccination coverage rates for children 35 months of age are listed in [Appendix 1](#).

- Comanche, Dickinson, Ellis, Hodgeman, Lane, Logan, Norton, Pawnee, Pottawatomie, Rooks, Rush, and Thomas counties met HP2020 goal for all vaccines.
 - Lane had 100% coverage for all vaccines.
- Chase, Cloud, Cowley, Greenwood, Morton, and Osborne did not meet HP2020 goals for any vaccines.
- Twelve (11%) counties had >10% of 35-month-olds not UTD for MMR1.

Implications:

- Counties with >10% of children 35 months of age not UTD for MMR1 do not have herd immunity, which protects those unable to be vaccinated because of medical reasons or being too young to be vaccinated.
 - Measles, mumps, and rubella affect young children most often and most severely.
 - While measles is no longer endemic in the United States, it is not uncommon for an international traveler to become infected while abroad and spread the virus upon return into the United States. Two recent outbreaks of measles in Kansas were due to international travel.
- Intervention programs to increase vaccination coverage among younger children should be focused in counties that did not meet HP2020 goals for any vaccines.
 - These counties are at increased risk for outbreaks of vaccine-preventable diseases.

Limitations:

- Vaccinations not required for kindergarten entry may not be consistently reported on the vaccination record, creating a possible underreporting of coverage for Hib3, HepA2, and PCV4.
- No descriptive data about sex, race, or ethnicity was collected and therefore effects of these factors on vaccination coverage could not be analyzed.

- Date of varicella disease was rarely given causing vaccine UTD status unable to be determined, so records where history of varicella was noted were not included in varicella coverage analysis.
 - Thirty-seven (0.47%) records were removed from varicella analysis.

Strengths:

- Vaccine coverage results provide good representation of children 24 and 35 months of age in Kansas due to:
 - Large sample size
 - Standardized random sampling techniques
 - High response rate

- Results enable state and local officials to identify counties and regions with low vaccine coverage levels.
 - Intervention programs should be focused to areas of lowest coverage for enhanced vaccination delivery methods and educational campaigns.

Appendix 1: Vaccination coverage levels of children 35 months of age by county, 2013-2014*§

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3-1-4
STATEWIDE	88%	94%	94%	89%	94%	92%	77%	74%	71%
ALLEN	87%	99%	96%	95%	97%	95%	73%	76%	64%
ANDERSON	85%	94%	89%	88%	92%	89%	66%	54%	64%
ATCHISON	79%	96%	84%	90%	99%	81%	71%	64%	67%
BARBER	86%	100%	93%	88%	90%	96%	65%	60%	53%
BARTON	91%	96%	95%	92%	96%	92%	88%	77%	84%
BOURBON	87%	96%	86%	93%	98%	91%	80%	72%	72%
BROWN	91%	97%	96%	95%	99%	94%	86%	73%	78%
BUTLER	88%	93%	92%	93%	90%	93%	85%	68%	76%
CHASE	79%	86%	79%	86%	79%	79%	69%	69%	59%
CHAUTAUQUA	92%	98%	92%	98%	98%	89%	85%	76%	79%
CHEROKEE	85%	93%	93%	93%	90%	94%	75%	70%	66%
CHEYENNE	96%	96%	96%	96%	96%	88%	79%	83%	79%
CLARK	98%	100%	98%	95%	96%	100%	79%	81%	76%
CLAY	88%	94%	90%	91%	93%	93%	90%	83%	85%
CLOUD	77%	81%	83%	83%	86%	83%	74%	72%	71%
COFFEY	90%	91%	90%	93%	91%	90%	86%	72%	83%
COMANCHE	96%	100%	100%	100%	100%	96%	92%	88%	92%
COWLEY	75%	89%	87%	88%	94%	88%	69%	61%	56%
CRAWFORD	84%	96%	95%	82%	92%	93%	71%	70%	59%
DECATUR	89%	89%	93%	93%	93%	96%	86%	86%	79%
DICKINSON	95%	98%	99%	90%	97%	99%	92%	89%	85%
DONIPHAN	84%	96%	97%	89%	97%	96%	81%	75%	70%
DOUGLAS	88%	93%	95%	89%	96%	94%	83%	80%	75%
EDWARDS	97%	97%	97%	100%	90%	90%	78%	86%	75%
ELK	96%	96%	96%	96%	100%	96%	88%	92%	88%
ELLIS	95%	98%	98%	95%	97%	96%	91%	89%	85%
ELLSWORTH	96%	94%	94%	95%	96%	94%	88%	90%	87%
FINNEY	85%	95%	96%	95%	99%	93%	80%	73%	74%
FORD	89%	95%	95%	92%	96%	95%	87%	77%	83%
FRANKLIN	84%	94%	95%	93%	97%	94%	77%	72%	72%
GEARY	90%	97%	97%	94%	96%	96%	82%	79%	72%
GOVE	86%	94%	94%	91%	94%	94%	80%	74%	77%
GRAHAM	97%	100%	97%	100%	97%	97%	87%	93%	87%
GRANT	87%	97%	93%	97%	97%	87%	83%	67%	73%
GRAY	81%	92%	92%	90%	89%	89%	72%	68%	65%
GREELEY	87%	100%	100%	93%	100%	93%	73%	80%	73%
GREENWOOD	79%	77%	80%	79%	81%	81%	77%	54%	69%
HAMILTON	100%	100%	100%	100%	100%	87%	83%	83%	83%
HARPER	88%	93%	95%	93%	95%	96%	79%	62%	64%
HARVEY	80%	84%	95%	85%	82%	92%	72%	71%	63%
HASKELL	84%	96%	93%	91%	96%	91%	72%	77%	63%
HODGEMAN	100%	100%	100%	100%	100%	94%	100%	94%	94%
JACKSON	83%	90%	94%	92%	93%	92%	86%	77%	77%
JEFFERSON	86%	94%	95%	91%	93%	95%	90%	82%	78%

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3-1-4
STATEWIDE	88%	94%	94%	89%	94%	92%	77%	74%	71%
JEWELL	90%	95%	95%	95%	95%	95%	62%	52%	62%
JOHNSON	94%	96%	96%	94%	95%	95%	90%	84%	81%
KEARNY	88%	97%	99%	97%	97%	95%	85%	71%	83%
KINGMAN	92%	93%	93%	91%	93%	92%	76%	72%	70%
KIOWA	95%	100%	96%	95%	92%	90%	82%	90%	69%
LABETTE	80%	92%	84%	91%	93%	84%	75%	59%	65%
LANE	100%	100%	100%	100%	100%	100%	100%	100%	100%
LEAVENWORTH	77%	87%	89%	87%	90%	87%	75%	65%	63%
LINCOLN	92%	100%	100%	88%	100%	100%	83%	88%	83%
LINN	90%	96%	90%	96%	93%	87%	84%	55%	74%
LOGAN	96%	100%	100%	100%	100%	100%	98%	89%	93%
LYON	82%	93%	95%	90%	99%	94%	81%	77%	71%
MARION	88%	91%	93%	87%	92%	92%	84%	71%	76%
MARSHALL	94%	100%	99%	99%	99%	97%	90%	79%	86%
MCPHERSON	93%	95%	96%	71%	92%	96%	67%	69%	63%
MEADE	87%	95%	92%	90%	97%	92%	82%	77%	76%
MIAMI	84%	92%	93%	55%	95%	92%	45%	70%	43%
MITCHELL	88%	96%	96%	96%	93%	93%	84%	82%	79%
MONTGOMERY	88%	91%	93%	26%	91%	92%	19%	22%	16%
MORRIS	90%	98%	96%	98%	96%	94%	88%	82%	86%
MORTON	70%	74%	83%	79%	79%	74%	62%	64%	59%
NEMAHA	95%	98%	98%	98%	94%	98%	92%	79%	85%
NEOSHO	86%	93%	92%	96%	92%	91%	26%	68%	25%
NESS	86%	100%	100%	96%	97%	100%	88%	77%	78%
NORTON	100%	100%	100%	100%	100%	100%	93%	97%	93%
OSAGE	91%	96%	96%	96%	91%	96%	80%	79%	73%
OSBORNE	77%	88%	88%	85%	88%	88%	69%	58%	69%
OTTAWA	80%	95%	94%	95%	94%	95%	80%	89%	70%
PAWNEE	100%	100%	100%	100%	90%	100%	100%	100%	90%
PHILLIPS	87%	95%	95%	95%	95%	95%	87%	87%	82%
POTTAWATOMIE	95%	97%	98%	97%	99%	99%	90%	88%	87%
PRATT	82%	99%	97%	99%	99%	96%	79%	75%	77%
RAWLINS	94%	94%	94%	94%	94%	94%	89%	72%	89%
RENO	76%	80%	92%	91%	83%	92%	70%	59%	68%
REPUBLIC	90%	97%	90%	97%	97%	86%	83%	73%	77%
RICE	88%	96%	97%	86%	93%	90%	67%	68%	64%
RILEY	92%	95%	96%	97%	98%	96%	90%	84%	79%
ROOKS	100%	100%	100%	97%	100%	100%	97%	97%	94%
RUSH	92%	100%	100%	92%	92%	92%	92%	85%	69%
RUSSELL	82%	97%	94%	95%	97%	96%	85%	86%	76%
SALINE	92%	99%	99%	95%	98%	98%	89%	78%	82%
SCOTT	97%	100%	97%	100%	97%	97%	93%	83%	90%
SEDGWICK	86%	94%	93%	91%	93%	93%	79%	76%	70%
SEWARD	90%	99%	94%	96%	93%	88%	71%	76%	67%
SHAWNEE	89%	95%	93%	94%	95%	93%	82%	79%	78%
SHERIDAN	90%	100%	100%	100%	97%	100%	90%	83%	87%

COUNTY	DTaP4	Polio3	MMR1	Hib3	HepB3	Var1	PCV4	HepA2	4-3-1-3-3-1-4
<i>STATEWIDE</i>	88%	94%	94%	89%	94%	92%	77%	74%	71%
SHERMAN	83%	97%	97%	97%	97%	93%	90%	76%	83%
SMITH	86%	97%	93%	97%	97%	94%	82%	76%	76%
STAFFORD	90%	90%	98%	90%	95%	98%	88%	82%	85%
STANTON	88%	96%	92%	96%	96%	84%	76%	60%	72%
STEVENS	94%	96%	93%	90%	100%	90%	81%	74%	72%
SUMNER	79%	88%	90%	86%	87%	86%	73%	68%	64%
THOMAS	98%	100%	98%	99%	96%	96%	95%	90%	88%
TREGO	83%	97%	93%	93%	97%	93%	83%	83%	83%
WABAUNSEE	90%	97%	92%	93%	97%	90%	89%	88%	84%
WALLACE	76%	90%	83%	90%	90%	82%	59%	46%	59%
WASHINGTON	95%	97%	98%	96%	95%	99%	86%	86%	78%
WICHITA	89%	93%	93%	89%	93%	93%	81%	78%	78%
WILSON	85%	98%	95%	95%	94%	94%	77%	69%	74%
WOODSON	90%	100%	93%	97%	97%	97%	83%	77%	80%
WYANDOTTE	86%	89%	93%	82%	91%	90%	72%	74%	63%

* Based on the retrospective survey for the school year starting 2017.

§ Hib3, HepA2, and PCV4 are not required for school entry, therefore may not be consistently reported on the vaccination record, which could contribute to the low coverage levels for these three individual vaccines, as well as the 4-3-1-3-3-1-4 series.